NCWM Petroleum Subcommittee Meeting

Andrew Buczynsky

GM Powertrain, Fuels and Lubricants

January 24, 2007

ASTM D 4814

- **The scope of D 4814 states:**
  - *1.3 The spark-ignition engine fuels covered in this specification are gasoline and its blends with oxygenates, such as alcohols and ethers.*
- **D 4814 is based on technical data**
  - Numerous CRC programs were conducted to develop the current volatility classes
  - Temperature data and distribution logistics were also taken into consideration in establishing the volatility classes
  - The proper process for change is a request to Subcommittee A
  - Changes to property limits require data demonstrating no degradation of vehicle performance

ASTM D 4814

- The auto industry uses fuels meeting the various volatility classes of D 4814 for its engine calibration work
- Changes to D 4814 that are piecemeal, based on individual state waivers and exemptions, will create another set of boutique fuels
  - The volatility limits in D 4814 are already wide enough that more permutations of fuel volatility, temperature, and geography will results in un-optimized calibrations
  - There is a trade off in simultaneously calibrating for good driveability and tight emissions standards

Alliance fuel survey data

- The Alliance conducts fuel surveys twice a year (January and July)
- Data for E10 from the two 2006 surveys were analyzed for conformance to ASTM volatility limits
- Goal was to see how many E10 sample do not meet ASTM volatility limits

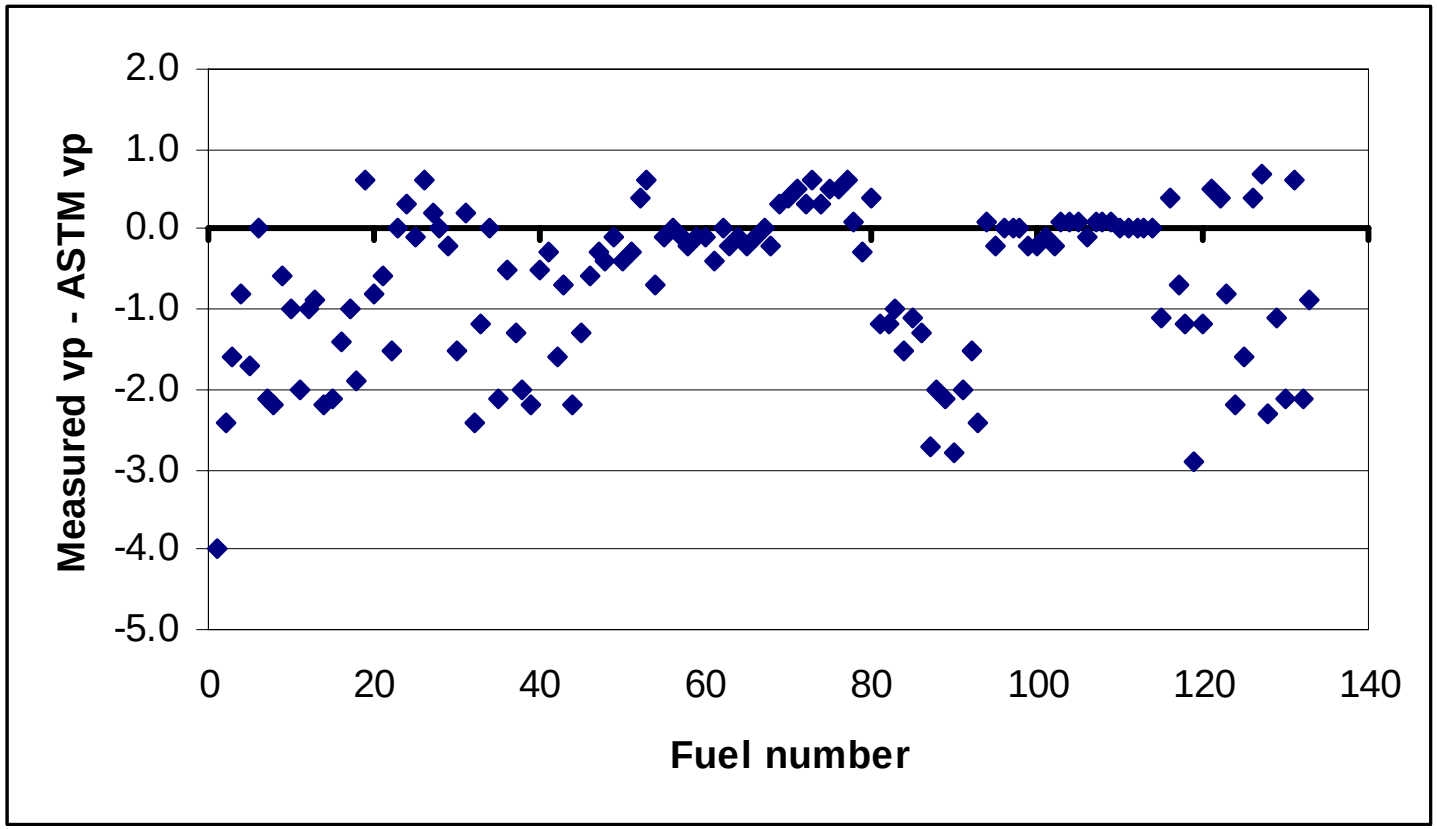
GM

Alliance fuel survey data

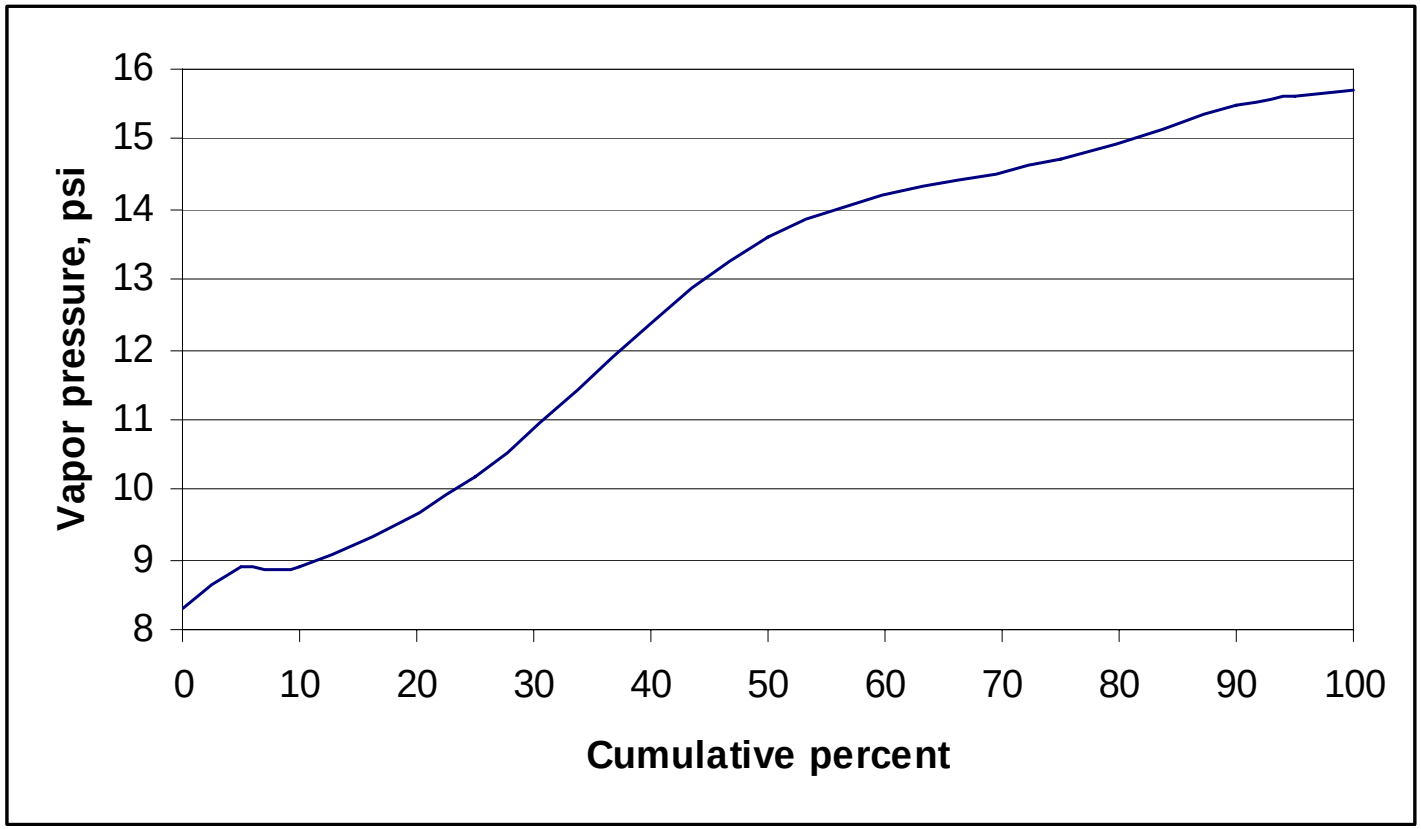
- **Survey details**
  - Samples containing at least 9.0 volume % ethanol were used in the analysis
  - Winter 2006: 133 samples
  - Summer 2006: 152 samples
  - Cities and number of samples (winter/summer):
    - Albuquerque (1/2), Boston (2/13), Chicago (15/16), Cleveland (12/7), Dallas (0/14), Denver (10/9), Detroit (11/8), Houston (0/14), Kansas City (2/1), Las Vegas (15/0), Minneapolis/St. Paul (12/14), New York (13/16), Philadelphia (0/12), Phoenix (21/0), Pittsburgh (0/1), Seattle (3/3), St. Louis (16/12), Washington, D.C. (0/10)

Vapor pressure – winter 2006

17.3% out of compliance for ASTM

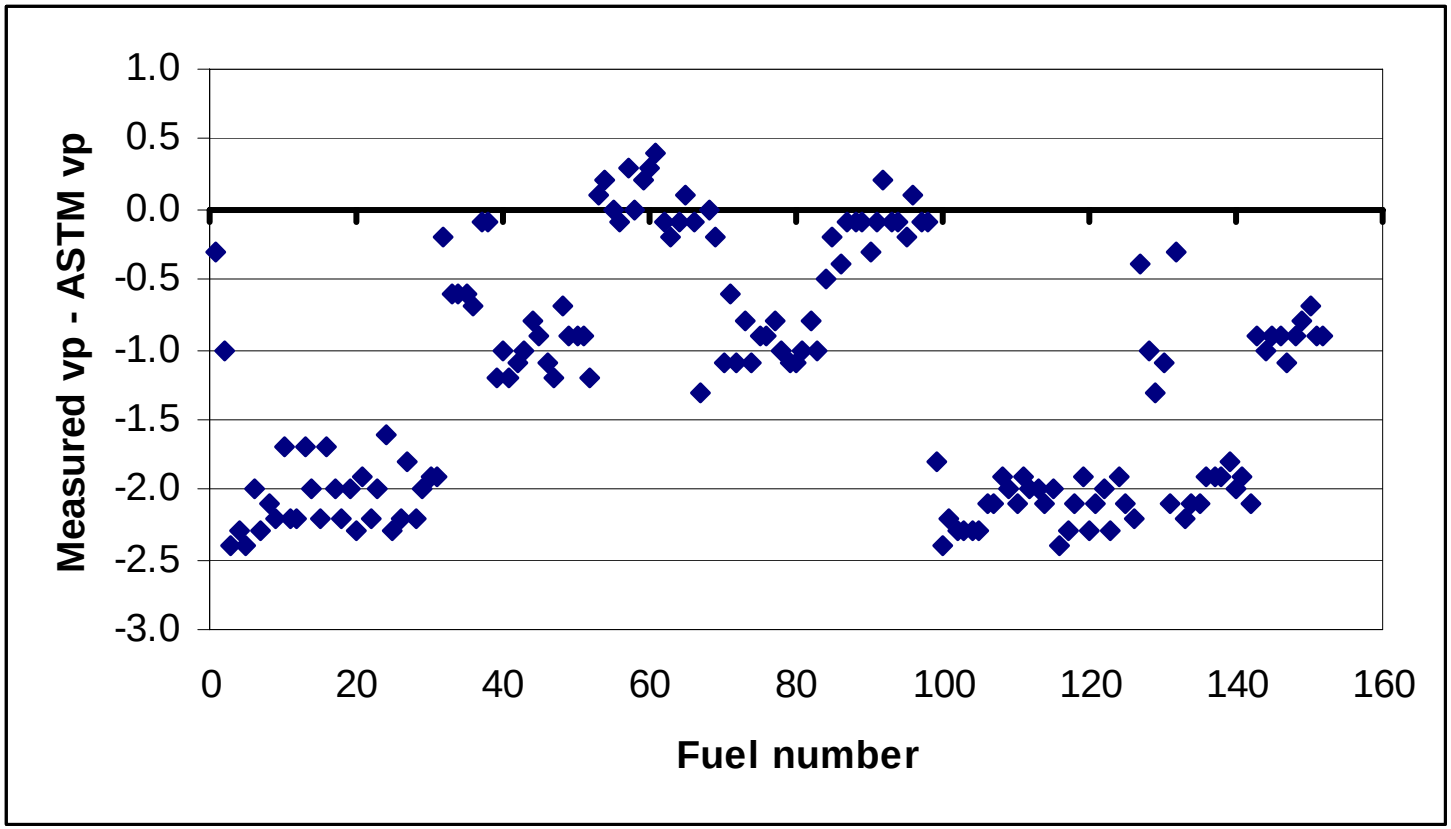


Vapor pressure – winter 2006



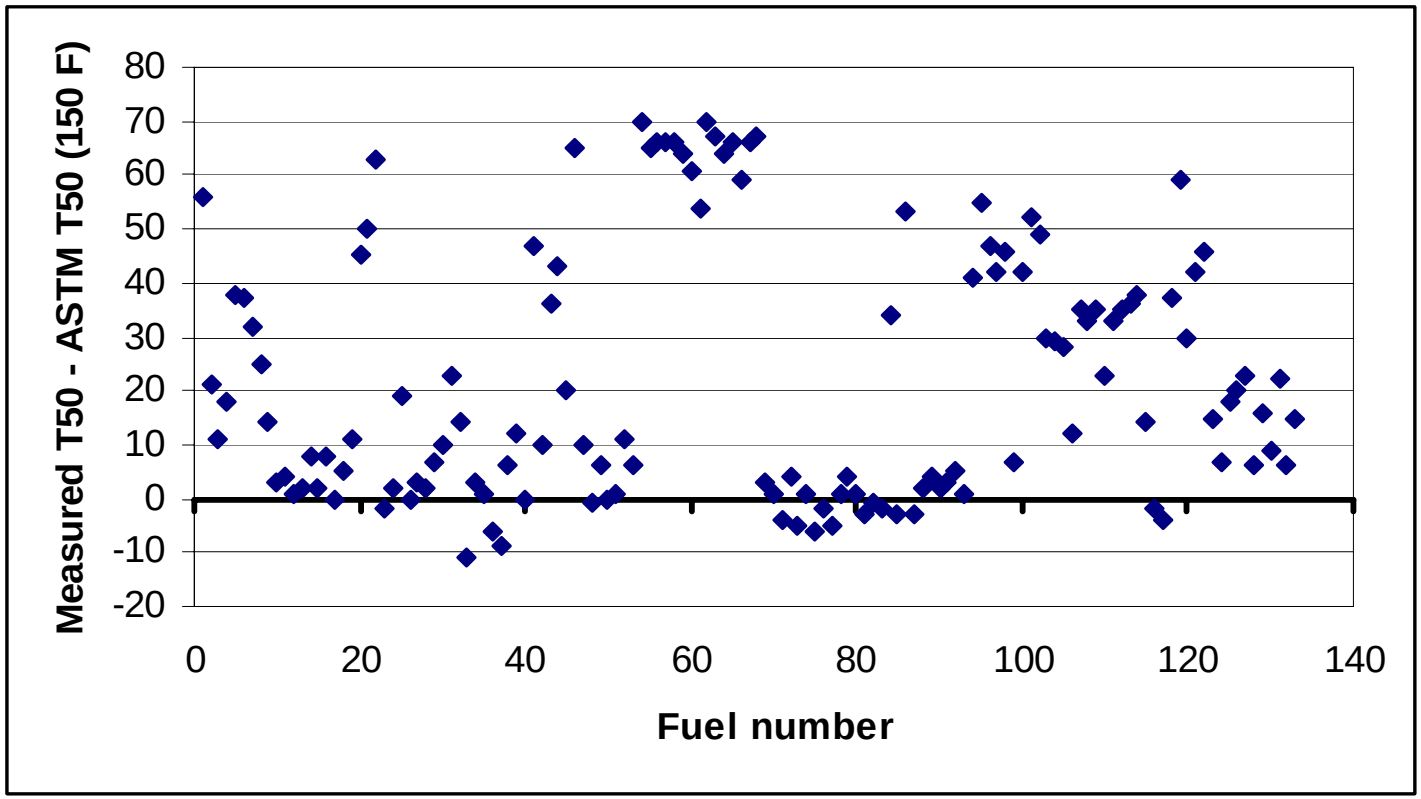
Vapor pressure – summer 2006

3.9% out of compliance for ASTM

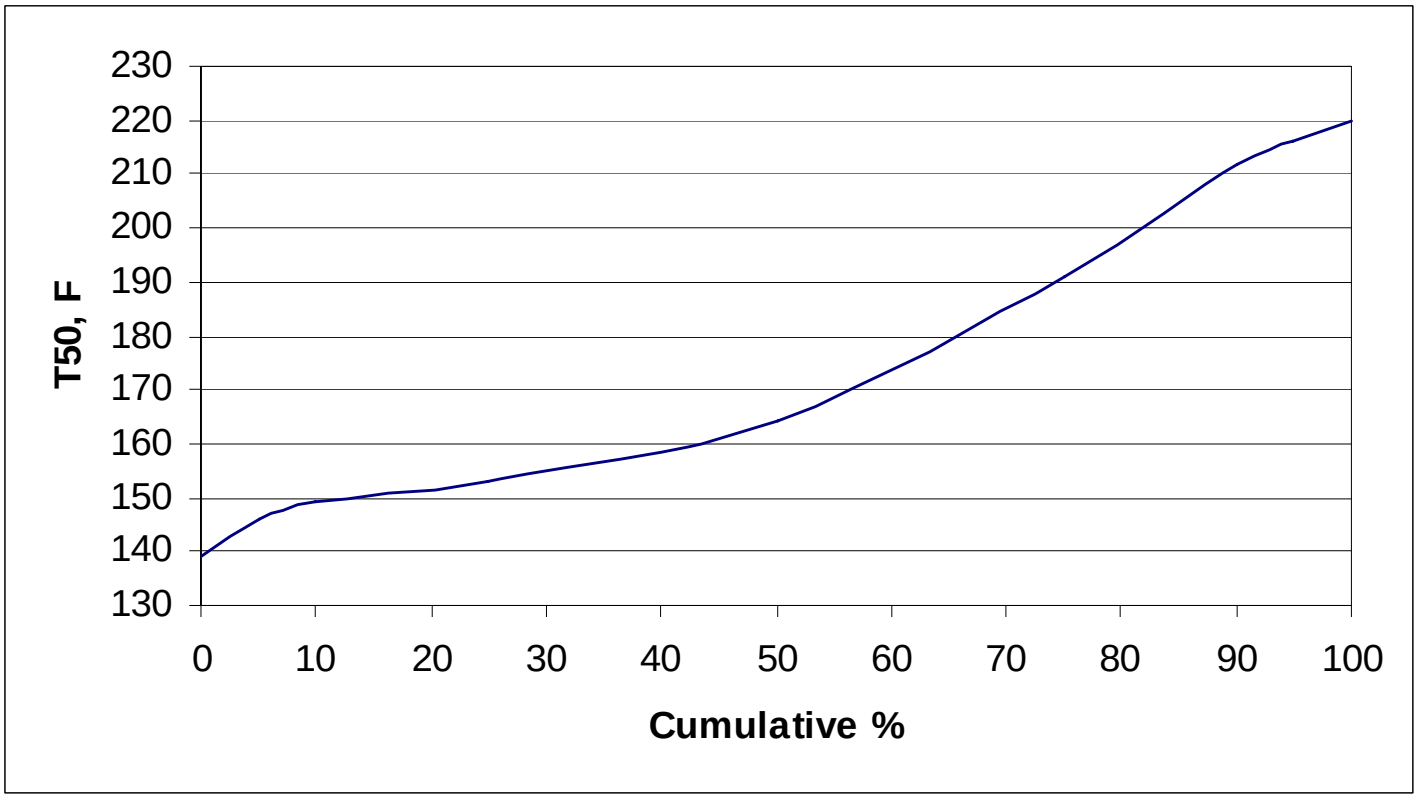


T50 – winter 2006

12.8% out of compliance for ASTM

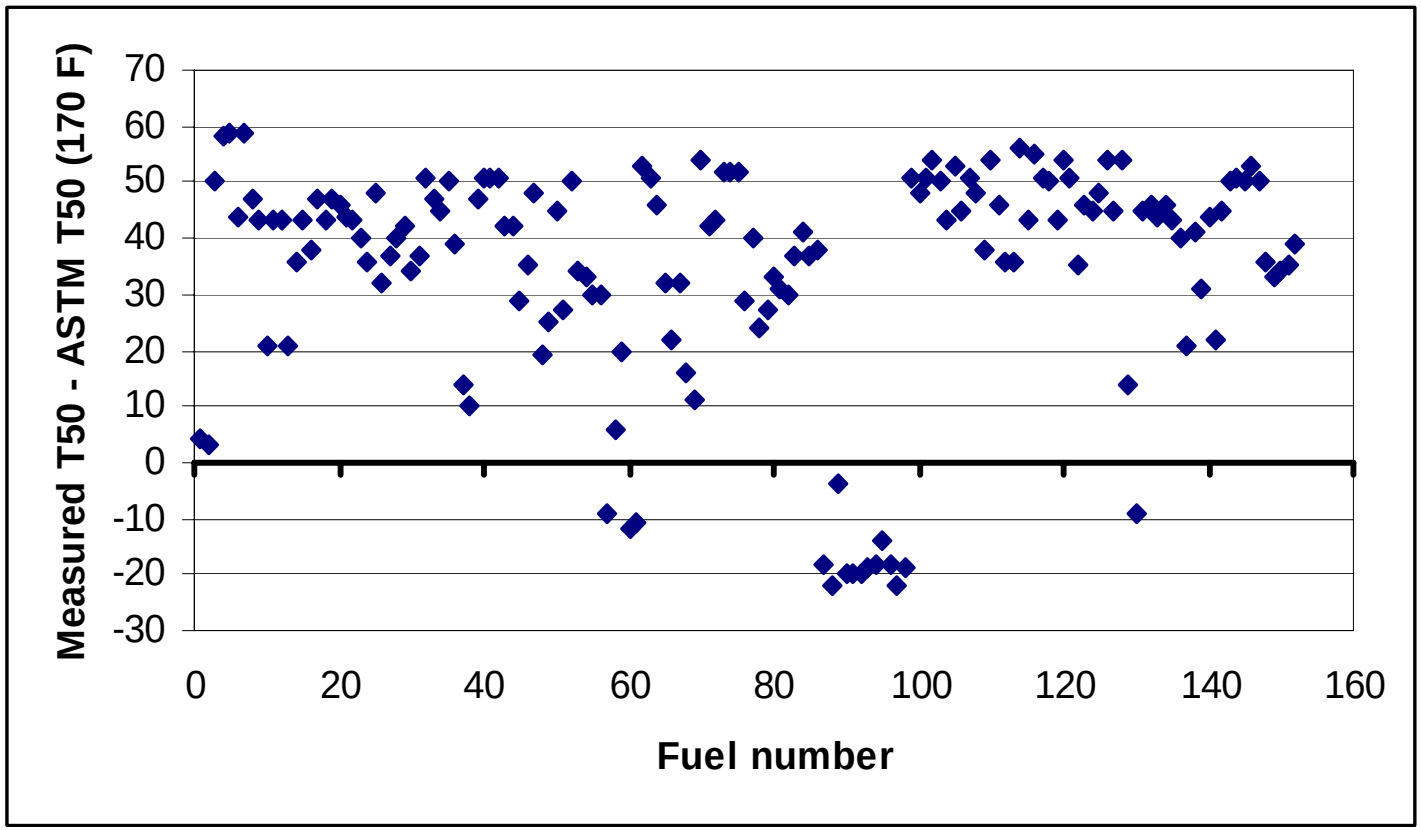


T50 – winter 2006

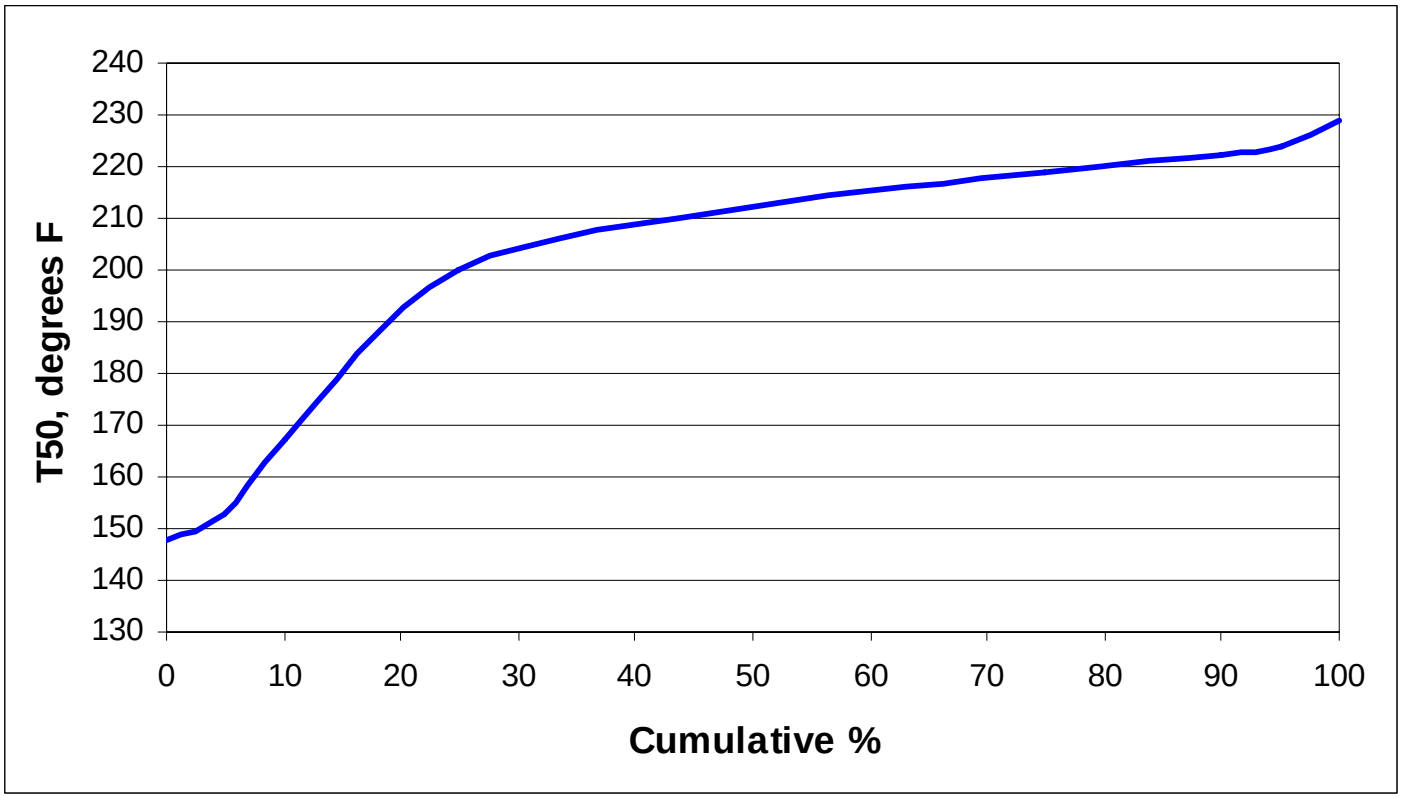


T50 – summer 2006

10.5% out of compliance for ASTM

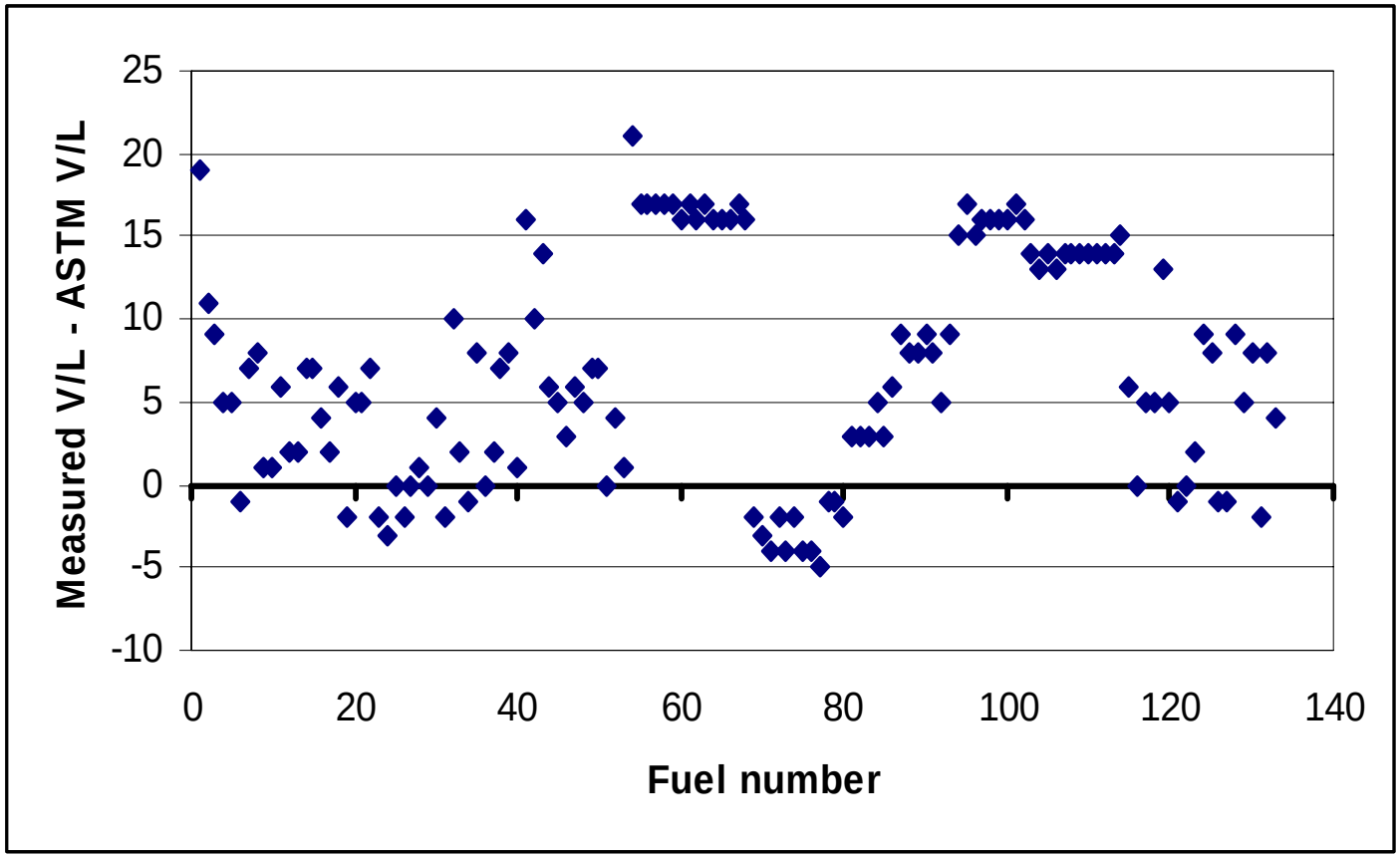


T50 – summer 2006

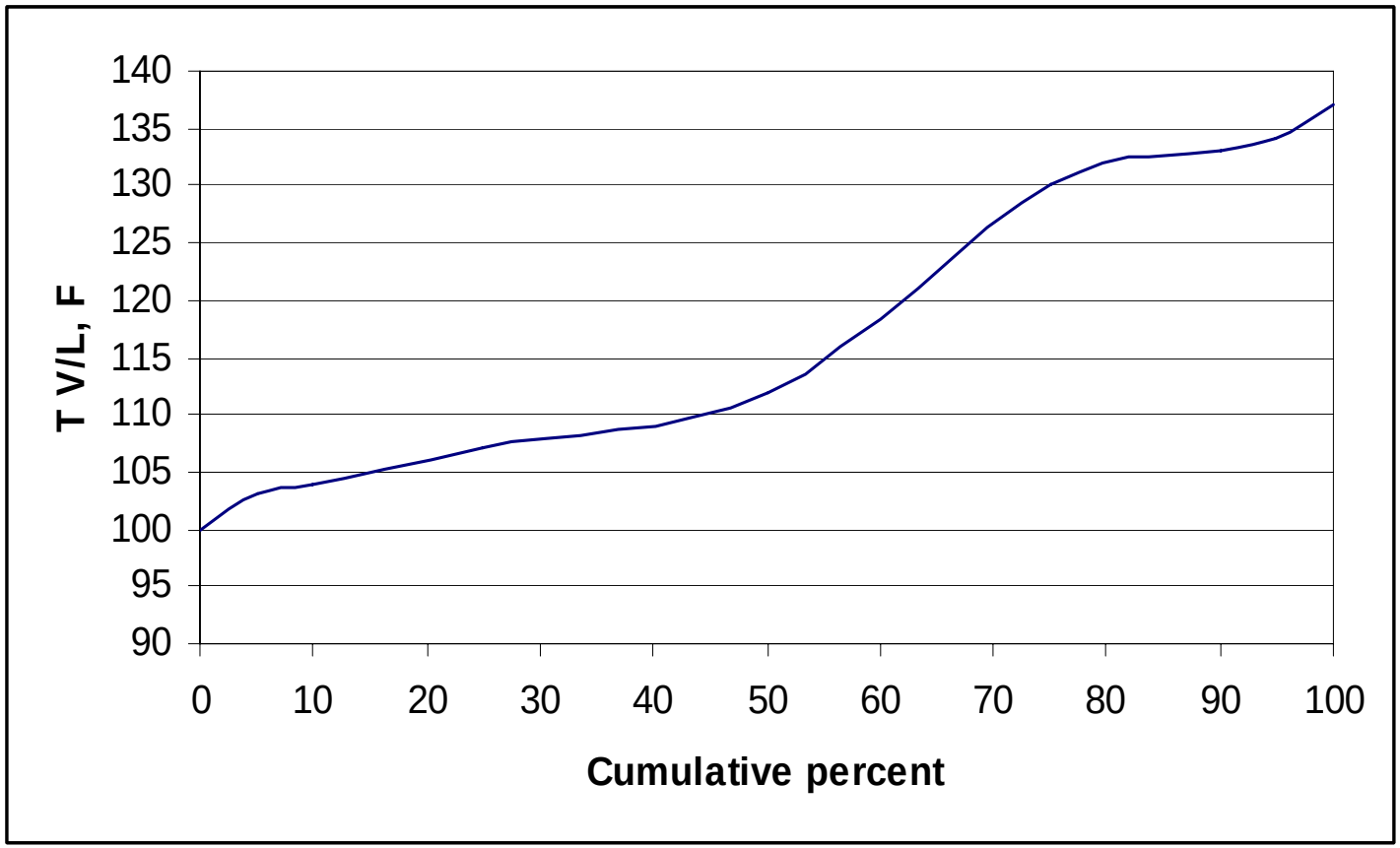


T-V/L 20 – winter 2006

17.3% out of compliance for ASTM

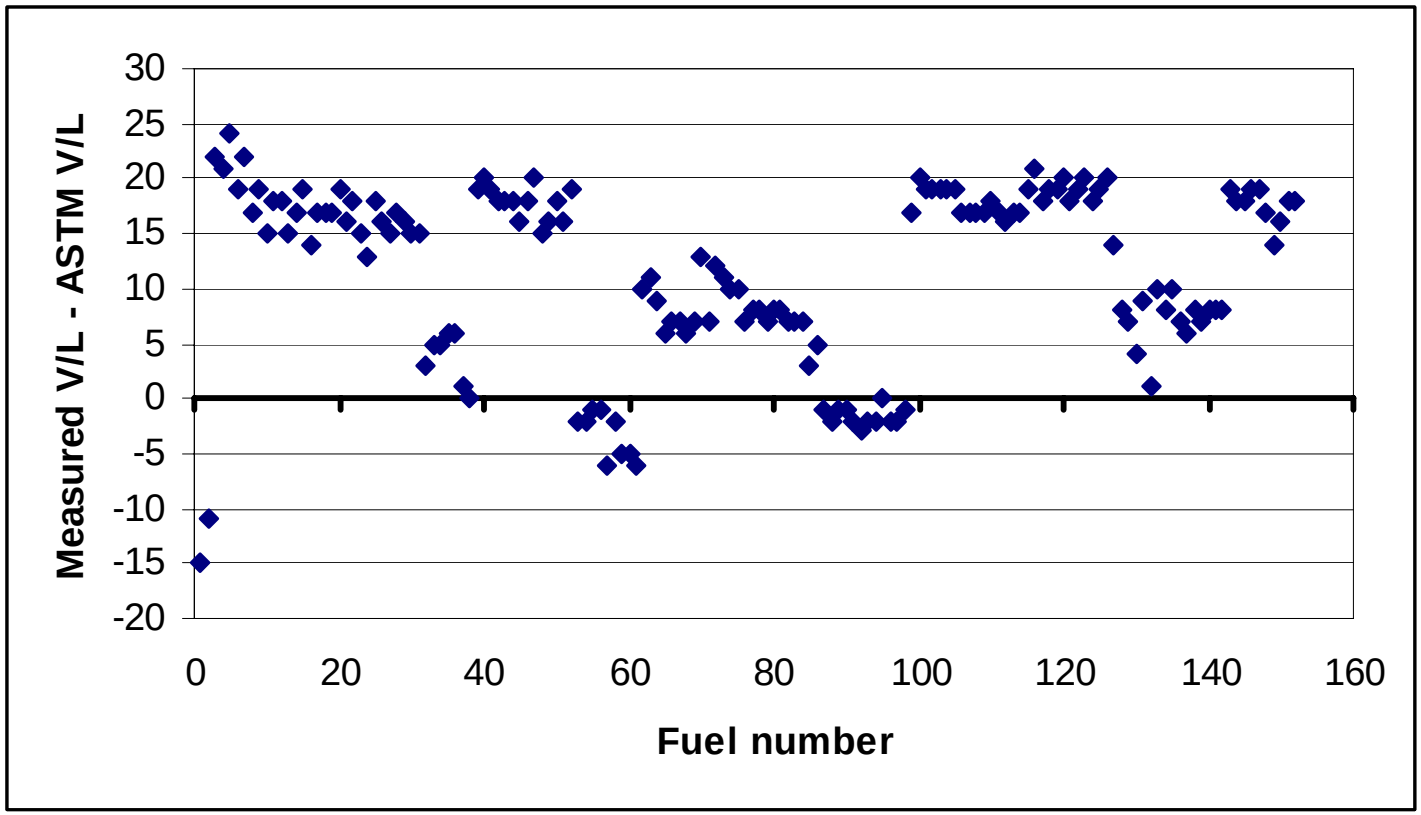


T-V/L 20 – winter 2006

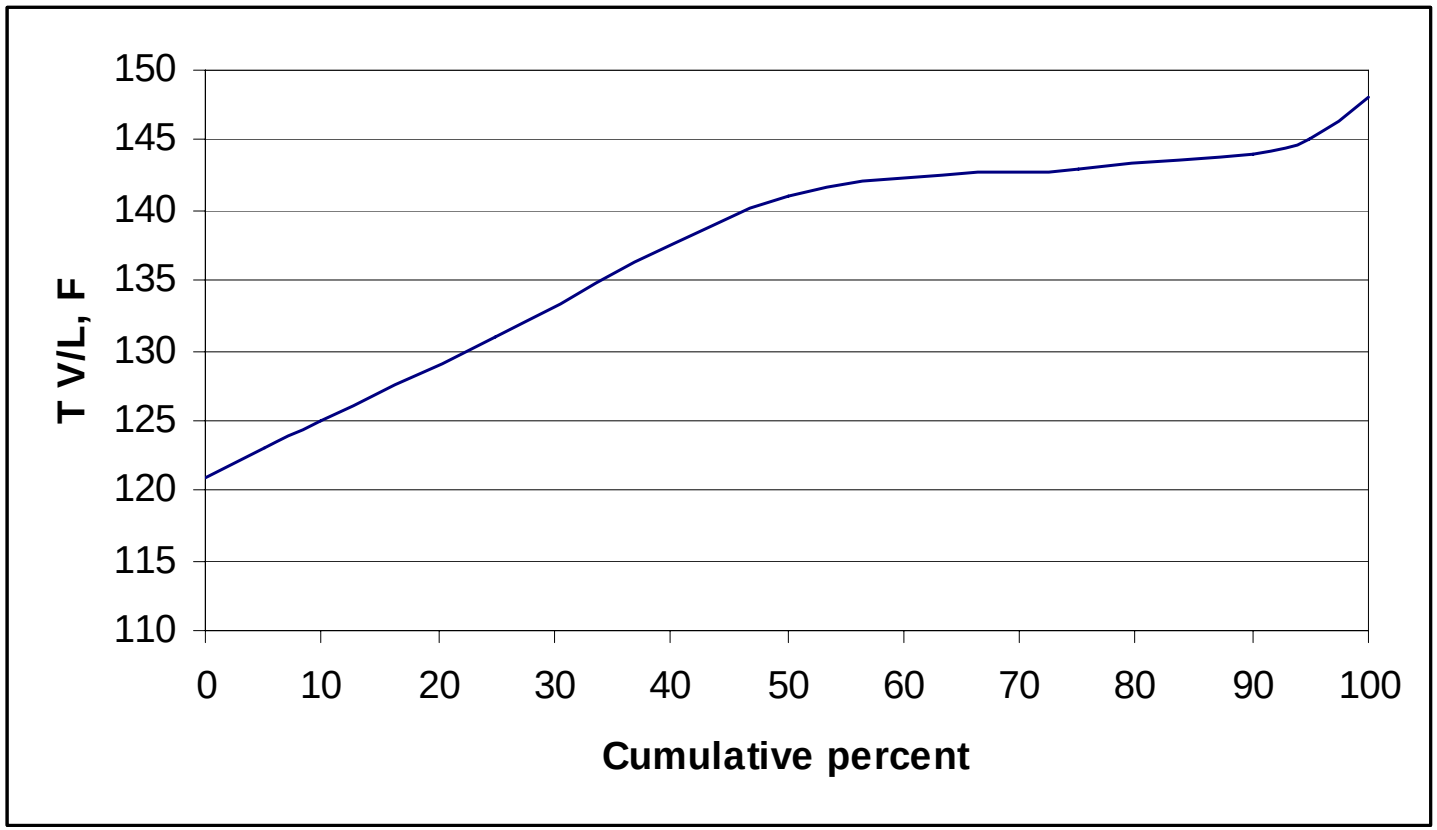


T-V/L 20 – summer 2006

14.5% out of compliance for ASTM



T-V/L 20 – summer 2006



One experience with non-ASTM fuel

- **Ambient conditions**
  - NW New Mexico: altitude approximately 5,000 ft
  - summer 2005: temperatures greater than 90°F
- **Symptoms**
  - Inability to restart hot engine or hard start
  - Stalls with hot engine
  - Affected a large number of customers
  - Information from customers pointed to two brands coming from one refiner
  - At least one other OEM experienced similar problems

One experience with non-ASTM fuel

- **Fuel analysis**
  - Retail samples from 6 brands were collected in July and sent to an independent lab for analysis
  - Four brands were E0
    - VP: 8 – 9 psi
    - T50: 178 - 216°F
    - T V/L 20 (calc): 133 - 145°F
  - Three suspect fuels representing two brands from one refiner were E10
    - Vapor pressure: 9 – 10 psi
    - T50: 149 - 151°F (NM allows 158°F min during summer)
    - T V/L 20 (meas): 124 - 128°F
      - ✓ Below either vapor lock protection for July (140°F min) or August (133°F min)

GM

One experience with non-ASTM fuel

- **Dealers experiences**
  - Immediate response was to replace fuel pump
    - Did not necessarily eliminate the problem
  - Switching to one of the brands that did not have low T50 or T V/L 20 without replacing the pump was effective in eliminating the problem
- **Data was shared with NM Petroleum Standards Bureau**

Conclusions

- Survey data indicate the majority of E10 can meet ASTM volatility limits
  - Non-compliant fuel is generally limited to specific geographic areas
  - The drive to even lower vapor pressure will make E10 less prone to exceed ASTM volatility limits
- Vehicle hot driveability problems have been observed with fuels not meeting ASTM summertime volatility limits
  - Significant negative impact on consumers and OEMs

GM